

No. V.—On the morning of the 28th this area was central in the western portion of Minnesota. Light rains were reported from the Missouri valley, and heavy rains, accompanying thunder storms, from Texas. The depression moved slowly southward during the 28th, and on the morning of the 29th was southwest of Omaha, where it remained stationary until midnight. On the morning of the 30th it was southwest of Leavenworth; at the afternoon report it was central in Indian Territory. During the 31st it moved to Southern Texas, where it ceased to exist as an independent depression.

INTERNATIONAL METEOROLOGY.

Two International Charts, Nos. V and VI, accompany the present REVIEW. The former, prepared for the month of June, 1877, is published in accordance with an explanation given in the leading paragraph under *International Meteorology* in the January, 1881, REVIEW. The barometric pressure over India, which, beginning with the chart for January, 1877, was indicated by isobars in broken lines copied from the "Report on the Meteorology of India for 1877," published by the government of that country, has, for the present month (June, 1877), been prepared from the data of simultaneous observations which were commenced by the Government of India on the first of that month. Chart No. VI is for June, 1879, and continues the series of this chart begun in October, 1877.

Chart No. V, shows the mean pressure, temperature, wind force and the prevailing direction of the wind at 7.35 a. m. Washington, or 0.43 p. m. Greenwich, mean time, for the month of June, 1877, over the northern, and at certain isolated stations in the southern hemisphere. The area of lowest pressure covers northwestern Siberia, extending thence eastward over the extreme northern portion of Russia and Scandinavia and still further eastward to Iceland and Greenland. The low area over Siberia appears to have been the result of a gradual translation northeastward of the low pressure of the previous month of *May*, which during that period occupied the region just north of the Black Sea. The depression over Iceland and Greenland appears to have resulted from a movement to the northeastward of a low pressure area, which in *May* prevailed over the Canadian Maritime Provinces. These two individual movements, pursuing almost parallel paths to the northeastward, appear to have combined their influences over the Arctic Ocean to the northward of Europe, affecting thereby in a marked manner the mean pressure over considerably more than 180° of longitude. The pressure is low throughout the interior of Asia and along the Asiatic coast. Over the United States the area of low extends northward from Texas to British America and thence eastward to Canada and the Maritime Provinces. The lowest pressures of the month were reported from the following stations: Yeniseisk, 29.65 (753.1); Ekaterinburg, 29.69 (754.1); Tromsø, 29.70 (754.4); Godthaab, Stykkisholm, Kasan and Archangel, 29.74 (755.4); Barnaul, 29.75 (755.7). The area of highest pressure, except at isolated stations, occupies Algeria and probably extends thence westward into the Atlantic. The isobar of 30.00 incloses southwestern Europe while considerably higher pressures occur at isolated stations in Prussia, Turkey and Italy. Over the United States this isobar covers the southeastern portion, including the Gulf and South Atlantic States, Tennessee and the lower half of the Middle Atlantic States. Pressures of 30.10 and above were reported from the following stations; Melbourne, 30.34 (770.5); Ponta Delgada, 30.21 (767.2); Mauritius, 30.20 (767.1); Kingston, Jamaica, and Angra, 30.17 (766.2); Cape Town, 30.15 (765.7); Portland, Or., Mexico and Honolulu, 30.13 (765.3); Valona, 30.14 (765.5); Funchal, Tabessa and Laghouat, 30.12 (765.1); Breslau, Sfax and Geriville, 30.11 (764.7); Frankfort-on-the-Main, 30.10 (764.5). The extreme monthly range of mean pressure is 0.69 inch, the largest since *February* and nearly double that of *May*. The lowest temperatures, given in Fahrenheit's scale, were reported from the following stations: York Factory, 38°; Godthaab, 44°; Stykkisholm, 46°; Ft. St. Michaels and Nikolaievsk, on the Amoor, 47°. In this connection it is desired to call attention to an error in calculation which occurred in obtaining the mean temperature of York Factory for *May*. It should have been entered 36° 5' instead of 43°, as indicated upon the chart for that month. The highest temperatures were reported from northern India and central Algeria, in the former ranging from 95° to 101° and in the latter from 85° to 97°. The prevailing direction of the wind was *variable* over the United States west of the 100th meridian, in the Lake region and in Canada, *southerly* over the interior, and *southwesterly* along the Atlantic coast. Over Europe, *southwesterly* along the coast and to a considerable distance inland; beyond the 10th meridian *east* and in Algeria *north* and *northwest*. Over Asia *variable* and in India *southwest* to *west* and *northwest*. Compared with the preceding month there has been a general rise in pressure over North America south of parallel 50° ranging from +0.02 to +0.11 inch, while to the northward the decrease has been quite marked, being -0.16 inch at York Factory. Over Europe south of parallel 60° the increase in pressure has been quite large, ranging in the extremes from +0.08 to +0.22 inch. In Scandinavia and eastward over Russia and Siberia there has been a decided decrease, ranging from -0.02 to -0.27 inch. At isolated stations the following changes are noted: Melbourne, +0.39 inch; Ft. St. Michaels, +0.28; Hobart Town, +0.24; Ft. Napier, +0.21; Ponta Delgada and Angra, +0.15; Cape Town, +0.18; Mauritius, +0.10; Free Town, +0.06; Para-

maribo, +0.05; City of Mexico, +0.03; Honolulu, Funchal and Beirut, +0.02; Stykkisholm, -0.30; Barnaul and Gothaab, -0.24; Vladivostok, -0.20; Fao and Yeniseisk, -0.19; Pekin, -0.18; Tromso, -0.15; Tokei, -0.13; Zi-Ka-Wei, -0.11; Yokahama, -0.02. With respect to the temperature, the isotherm of 40° has entirely disappeared except at York Factory, where the mean is 38°. Stations reporting a change of 1° or less are as follows: Paramaribo and the City of Mexico, 0°; Bridgetown, Fort de France, Kingston Jamaica, San Jose de Costa Rica, Cape Town and Honolulu, 1°. Compared with *June*, 1878, the pressure is generally higher over North America, except in the Canadian Maritime Provinces. Over Europe the same can be said, but with more emphasis, the isobars of 30.00 and 30.10 occupying nearly the same positions as those of 29.90 and 30.00 respectively. But over Scandinavia and eastward into Russia and Siberia the reverse takes place, it being alike the region of lowest pressure in each year, over which the isobar of 29.70 replaces that of 29.80. Over the Japan Islands and at Zi-Ka-Wei the pressure is a little higher, while northward along the Asiatic coast it is below. At isolated stations the following changes are noted: Melbourne, +0.34 inch; Hobart Town, +0.21; Ft. St. Michaels, +0.13; Ft. Napier, +0.11 inch; Mauritius, +0.08; Cape Town and the City of Mexico, +0.06; Kingston Jamaica, and Paramaribo, +0.03; Fort de France, 0.00; Stykkisholm, -0.12; Gothaab, -0.11; San Juan de Puerto Rico, -0.07; Bridgetown, -0.06. Over India the changes are small, the pressure being higher while the reverse applies to the temperature. The temperature is generally higher over southern Europe, but considerably lower over northern Scandinavia and Russia, with slight changes over the British Isles. In the United States it is lower over the northern and southern portions, but remains about stationary in the central. At isolated stations the following changes occur: Yeniseisk, +10°; Ft. St. Michaels +8°; Barnaul, +6°; Vladivostok, Tokei and Yokahama +4°; Cape Town and Pekin, +3°; Melbourne, +2°; Hobart Town and Gothaab, +1°; Mauritius, Zi-Ka-Wei, Nassau and San Juan de Puerto Rico, no change; York Factory, -15°; Archangel and Nikolaievsk, on the Amoor, -9°; Nukuss, -6°; Stykkisholm, -5°; Free Town and Kingston Jamaica, -2°; Beirut, Tifis, Tashkend, Ft. Napier, Paramaribo, Bridgetown, Fort de France, Navassa, Havana and the City of Mexico, -1°.

Chart No. VI.—Upon this chart are traced the paths of 22 of the principal storm areas of the northern hemisphere, during the month of June, 1879. Of these, 10 appear to have originated within the boundaries of North America and generally within the latitudes of 40° and 55° N.; four of these storms reached the Atlantic beyond Newfoundland, while two crossed the ocean to near the mainland of northern Europe. Seven storms are located over Europe; three of these came from the ocean, two in the vicinity of latitude 60° N., and one from near latitude 40° N., longitude 50° W.; of the remainder one formed over the British Isles, one in central Spain and two in northern Russia. Three storms are located over eastern Asia, and one over the Japan Isles. One storm was confined almost entirely to the Atlantic, passing over the eastern portion of the British Isles. Of the storms of North America, No. I, a continuation of low area No. XXX of *May*, 1879, appeared on the 1st, in the Ohio valley and passing thence northeastward over the Lower Lakes, changed its course to the eastward north of Kingston Can., after which it passed off the Atlantic coast and disappeared south of Newfoundland on the 3d in the high pressure area then prevailing to the eastward of that island. No. IV first appeared on the 3d in Manitoba, and moving thence southeastward crossed Lake Superior, changing its course to the east until near longitude 75° when, on the 5th, it turned slightly to the northeast and then again to the east, crossing the Gulf of St. Lawrence and leaving the Atlantic coast near the Straits of Belle Isle. Very high winds, ranging from 55 to 66 miles, accompanied the progress of this storm near the mouth of the St. Lawrence and several vessels were wrecked. No. V first appeared on the 3d on the South Pacific coast. During that day and the following it moved northward into Oregon; from the 5th to the 7th northeastward across Idaho and Montana, disappearing on the 8th to the northward of Manitoba. During the progress of this storm the highest wind velocities of the month occurred at stations in Utah and Nevada, and high northwest winds with considerable damage to shipping was reported from the Pacific coast near San Francisco. No. VII probably formed as a secondary depression to No. VI during the presence of the latter in western Wyoming. On the 7th this area passed southeastward across Wyoming, and on the 8th and 9th northeastward from Colorado to Lake Superior. During its passage over western Kansas and Nebraska terrific storms of wind, hail and rain were experienced. In several instances small towns were almost entirely destroyed and the loss in agricultural sections was immense. On the 10th the storm area was central over Lake Superior, and on the 11th crossed Canada, reaching the Gulf of St. Lawrence by the 12th. During this day and the following it passed southeastward over Cape Breton Island to the ocean. On the 13th, in 35° 30' N. 57° W. ship *Hale* reported squall from SW. with hurricane force continuing for four hours and accompanied with blinding rain. In 28° 31' N. 66° 57' W. ship *Russell* reported violent SE. squall with heavy rain, vessel on beam's end. On the 14th the centre of lowest pressure was situated to the south of Newfoundland, barometer at Sydney, Cape Breton Island, 29.45, wind NW., clear; at St. John's, Newfoundland, barometer 29.47, wind SE., light rain. In 38° 30' N. 56° 30' W. barometer 29.57, wind W., light rain. On the 15th storm passed northeastward to near latitude 50°, barometer at St. Johns, Newfoundland, 29.49, wind

SW., fair. The winds over the Maritime Provinces changed to west and southwest with rising barometer and clearing weather. In $43^{\circ} 29' \text{ N. } 57^{\circ} 40' \text{ W.}$, ship *Nevada* reported strong westerly gale, cloudy, heavy west sea. In $46^{\circ} 41' \text{ N. } 38^{\circ} 24' \text{ W.}$, ship *Western* reported strong southwest-erly gale, heavy head sea. On the 16th, passed northward of latitude 50° where it disappeared in a high pressure area extending southward from Greenland. No. VIII appeared to have formed on the 9th over the ocean to the eastward of British Columbia. On the 10th lowest pressure central in Idaho. During the 11th, 12th and 13th, passed from Colorado northeastward to Minnesota, and by midnight of the 15th had reached the Atlantic coast south of Connecticut. On the 16th, passed eastward over the ocean to longitude 60° accompanied by northwest to southwest winds and heavy rains. In $39^{\circ} \text{ N. } 71^{\circ} \text{ W.}$, barometer 29.47, wind W.; in $41^{\circ} \text{ N. } 64^{\circ} \text{ W.}$, barometer 29.60, wind SW., heavy rain; in $42^{\circ} 30' \text{ N. } 66^{\circ} 30' \text{ W.}$, barometer 29.49, wind SE.; in $42^{\circ} 16' \text{ N. } 63^{\circ} 30' \text{ W.}$ heavy SW. squall, thick fog. On the 17th centre of lowest pressure moved northeastward to about $45^{\circ} \text{ N. } 46^{\circ} \text{ W.}$. In $42^{\circ} \text{ N. } 48^{\circ} \text{ W.}$, barometer 29.65, wind SW. heavy rain; in $40^{\circ} 30' \text{ N. } 53^{\circ} \text{ W.}$, 29.77, SW. heavy rain; in $49^{\circ} 36' \text{ N. } 41^{\circ} 04' \text{ W.}$ heavy southwesterly gale. During 18th and 19th centre of lowest pressure moved northeastward to about $55^{\circ} \text{ N. } 20^{\circ} \text{ W.}$; 18th, in $48^{\circ} 41' \text{ N. } 32^{\circ} 22' \text{ W.}$, SW. to NW. fresh gale, high westerly sea; in $50^{\circ} 30' \text{ N. } 28^{\circ} 09' \text{ W.}$, WSW. moderate gales, hard squalls and heavy seas. 19th, in $47^{\circ} 18' \text{ N. } 37^{\circ} 14' \text{ W.}$, WNW. strong, heavy squalls; in $48^{\circ} 05' \text{ N. } 27^{\circ} 23' \text{ W.}$, westerly gales, high head sea; in $48^{\circ} 49' \text{ N. } 33^{\circ} 10' \text{ W.}$, NW. gales, heavy rains and lightning; in $48^{\circ} 30' \text{ N. } 13^{\circ} \text{ W.}$, barometer 29.36, wind SW., fair; throughout the western portion of the British Isles rapidly falling pressure and southwest to southeast winds increasing to gales with rain on the Irish coast prevailed. On the 20th centre of lowest pressure to the southwest of Iceland, barometer at Stykkisholm 29.26, wind SE., light rain. In $50^{\circ} 03' \text{ N. } 22^{\circ} 59' \text{ W.}$, wind NW. decreasing, cloudy, rainy, high northwesterly sea. Over Scotland and to the northward, south to southeast winds and slowly falling pressure prevailed, while to the southward, over England and Ireland, west to southwest winds and rising pressure obtained. On the 21st centre of lowest pressure to the northward of Iceland, barometer at Stykkisholm 29.30, wind SE., rain; at Godthaab, Greenland, barometer 29.30, calm, fair. Over the islands to the north of Scotland winds still remained southeast, but with slowly rising pressure. This storm gradually gave away to the northward as low area No. XVI formed to the south of Iceland on the 21st. No. XVII appeared to form over British Columbia on or about the 20th, and passed thence south-eastward into Wyoming Territory, and, after pursuing an irregular northeasterly course over the Upper Missouri valley left the United States near longitude 90° W. On the 25th this depression began gradually to fill up over Hudsons Bay. York Factory, B. A. reported as follows:—23rd, 29.78, 52° W. ; 24th, 29.75, 56° SW. ; 25th, 29.83, 60° NNW. ; on this date, along the northern boundary of the United States between longitude 80° and 100° W. , the winds changed to SW. and W. with rapidly rising barometer. No. XIX, this depression, central in Colorado on the 23d, passed, during that day and following, northeastward over the Upper Mississippi valley to the Lake Superior region. On the 25th, after filling up considerably, it combined with low area No. XVII then over Hudsons Bay. No. XXI, on the 25th the barometer commenced falling over the Northern Rocky Mountain Slope, while to the southeast and northeast (separated therefrom by the isobar of 30.00) two areas of low pressure (surrounded each by isobars of 29.80) prevailed. On the 26th these two areas combined, forming a trough of low pressure extending southwestward from Hudsons Bay to Texas, lowest barometers as follows:—Dodge City, 29.53; Concho, Tex., 29.64; Marquette, 29.67; Pembina, Dak., 29.69. On the 27th, depression over the Northern Rocky Mountain Slope gradually filled up; trough of low pressure again divided assuming about the proportions and position maintained by the two areas on the 25th; isobars of 29.80 still unchanged. On the 28th, depression to the southward over Texas rapidly filled up; low area to the north fell rapidly at its centre with the isobar of 29.80 inclosing more than double the previous extent of territory; centre of lowest pressure over the Province of Quebec. 29th, centre of lowest pressure over the Gulf of St. Lawrence, inclosed by the isobar of 29.60; isobar of 29.80 extended southeastward to Georgia and east from longitude 83° W. to the Atlantic. 30th, area filled up slightly and moving northeastward over the ocean, gradually combined with a depression then prevailing to the southwest of Iceland. No. XXII appeared on the Middle Pacific coast on the 28th, and moved thence rapidly northeastward over the Plateau regions, reaching Manitoba by the 30th, barometer at Ft. Garry 29.49, wind S. No. XV, on the 17th the pressure began falling over the ocean to the west of Alaska peninsula, barometer at Sitka 29.87, wind S., strong, heavy rain; at Ft. St. Michaels, 29.95, N., fair. 18th, centre of lowest pressure in about $55^{\circ} \text{ N. } 120^{\circ} \text{ W.}$, barometer at Sitka, 30.05, wind SW. fresh, light rain; at Ft. St. Michaels, 30.03, SW., fair. 19th, centre of lowest pressure in about $55^{\circ} \text{ N. } 110^{\circ} \text{ W.}$, with the barometer slowly falling at York Factory and over the Saskatchewan valley, and rain, with southerly winds, to the southward near the boundary of the United States. 20th, lowest pressure over Manitoba; Ft. Garry, barometer 29.60, SW.; Pembina, 29.58, SW.; York Factory, 29.98, SE. From the 21st to 23d, depression moved eastward to the south of Hudsons Bay and thence northeastward off the Labrador coast, accompanied by no changes of importance so far as indicated upon the daily charts. During the 24th and 25th, centre of lowest pressure transferred southeastward over the ocean to about $50^{\circ} \text{ N. } 30^{\circ} \text{ W.}$ 25th, in $49^{\circ} 09' \text{ N. } 26^{\circ} 08' \text{ W.}$, variable winds, very heavy sea; in $47^{\circ} 49' \text{ N. } 35^{\circ} 57' \text{ W.}$, NW. fresh

gale, hard squalls; in $49^{\circ} 45' \text{ N. } 27^{\circ} 32' \text{ W.}$, barometer 29.56, NW. moderate gales; in $48^{\circ} 41' \text{ N. } 31^{\circ} 15' \text{ W.}$, W. to WNW. moderate to fresh gales, heavy head sea; in $51^{\circ} 30' \text{ N. } 23^{\circ} 30' \text{ W.}$, barometer 29.35, SSW., fair. From the 26th to 30th area of lowest pressure passed in an irregular northeasterly course between the British Isles and Iceland, where, on the latter date, it began gradually to fill up, although the area of low was still quite well marked. In connection with the passage of this storm during the last four days the lowest barometers of the month were recorded. 26th, in $53^{\circ} 45' \text{ N. } 20^{\circ} 30' \text{ W.}$, barometer 29.13, SW. strong; in $48^{\circ} 35' \text{ N. } 33^{\circ} 45' \text{ W.}$, 29.34, NNW. strong; in $45^{\circ} 29' \text{ N. } 39^{\circ} 29' \text{ W.}$, NW. strong gale, high seas; in $46^{\circ} 19' \text{ N. } 39^{\circ} 46' \text{ W.}$, fresh gale, hard squalls all day; in $48^{\circ} 38' \text{ N. } 33^{\circ} 57' \text{ W.}$, NW. to NE., moderate gales; in $46^{\circ} 44' \text{ N. } 37^{\circ} 44' \text{ W.}$, first part of day rainy with moderate gales; during afternoon strong gales, high NW. sea; over the British Isles the barometer ranged from 29.34 to 29.86, lowest at Galway, with occasional light rains and fresh to brisk winds changing from west to southwest and southeast. 27th, in $54^{\circ} 30' \text{ N. } 18^{\circ} \text{ W.}$, barometer 28.66, NW. brisk, fair; in $51^{\circ} 22' \text{ N. } 14^{\circ} 39' \text{ W.}$, SW., fresh gale, high confused sea; in $44^{\circ} 43' \text{ N. } 43^{\circ} 54' \text{ W.}$, N. hard gale, high north sea; over the British Isles barometer ranged from 29.22 to 29.94, lowest at Galway, with occasional light rains and southwest to southeast winds increasing to gales along the Irish coast. 28th, in $55^{\circ} 17' \text{ N. } 14^{\circ} 35' \text{ W.}$, barometer 29.18, strong SW. gale, high sea and threatening weather; in $51^{\circ} 16' \text{ N. } 14^{\circ} 02' \text{ W.}$, NW. fresh gale, high seas; in $50^{\circ} 55' \text{ N. } 20^{\circ} 32' \text{ W.}$, WNW. fresh gale, high head sea; Stykkisholm, 29.15, NE. brisk; over the British Isles barometer ranged from 29.32 to 29.98, (lowest at Sandwich Manse and Nairn,) with west to south winds and occasional light rains. 29th, in $54^{\circ} 45' \text{ N. } 19^{\circ} 52' \text{ W.}$ strong westerly gale, heavy sea, threatening weather; Stykkisholm, barometer 29.23, NE. gale, fair; Thorshavn, 29.43, SW. light, fair; over the northern portion of the British Isles barometer rose rapidly with west to south winds and clearing weather. 30th, Stykkisholm, 29.32, NE. gale, fair; Thorshavn, 29.63, SSE. light, fair. Concerning the storms located over Europe or reaching the mainland from the ocean, descriptions of their courses are given as follows:—No. II developed on the 1st over the British Isles as a secondary depression in connection with the passage of the area No. XXVII of the *May*, 1879, chart published in the *April*, 1881, REVIEW. During the 1st, 2d and 3d the storm centre remained about stationary over the British Isles and North sea, except a disposition on the 2d to move to the northwest beyond the former, caused by a rapid elongation of the low area, reaching from the coast of Norway southwestward to near latitude 40° N. But on the 3d, this movement was checked by a division of the trough of low pressure near latitude 50° N. followed by a decided transfer of the northern centre of the depression to the northeastward. On the dates above given occasional light rains fell over the British Isles, extending southward into France, accompanied by fresh to brisk southwest winds veering to north and northwest by the 3d. The barometric gradient was unimportant. On the 4th, centre of lowest pressure in southern Norway, barometer at Bergen 29.39; Christiana, 29.32, NE., light rain; Brono, 29.53, NE., light rain; Stockholm, 29.38, SSE., light rain. All stations in Sweden reported rain except Haparanda. 5th, lowest pressure near Gulf of Bothnia; Upsala, 29.55, S., light rain; Hernosand and Stockholm, 29.58, S., light rain. 6th, storm passed southeastward over Finland: St. Petersburg, 29.45, NNW., light rain; Kasan, 29.45, WSW., fair; Moscow, 29.52, SE. The pressure over Scandinavia rose rapidly with southwest to northwest and northeast winds. 7th, depression moved east southeast to near longitude 50° E. : Krotkowsk, 29.52, NW.; Kasan, 29.39, WNW.; Ekaterinburg, 29.52, ESE, light rain. 8th, course directly east; Ekaterinburg, 29.18, NE., light rain. 9th, moved northeastward and crossing the Obi river near latitude 60° N. ; Ekaterinburg, 29.48, NNW. 10th, moved east northeast to near longitude 80° E. ; Yeniseisk, 29.42, SSE., thunderstorm; on this date and the following the depression gradually filled up over western Siberia. No. IX, developed over the ocean on the 11th; first appearing in about $42^{\circ} \text{ N. } 46^{\circ} \text{ W.}$; on this date the pressure was generally below 29.90 over the ocean from latitude 35° to 50° and from the British Isles westward to longitude 50° . In $40^{\circ} \text{ N. } 42^{\circ} \text{ W.}$, barometer 29.68, W. brisk; in $46^{\circ} 22' \text{ N. } 47^{\circ} 44' \text{ W.}$, a. m., moderate W. gale, fog; noon, strong N. breeze; 4 p. m., NW. strong gale. 12th, in $41^{\circ} 39' \text{ N. } 37^{\circ} 45' \text{ W.}$, 29.44, SW. strong; in $49^{\circ} 15' \text{ N. } 38^{\circ} 45' \text{ W.}$, 29.44, NE. strong gale, heavy rain. 13th, in $48^{\circ} 30' \text{ N. } 36^{\circ} 30' \text{ W.}$, 29.48, N. fair; in $45^{\circ} 30' \text{ N. } 41^{\circ} 25' \text{ W.}$, 29.78, NNW. threatening; in $42^{\circ} 30' \text{ N. } 33^{\circ} 30' \text{ W.}$, 29.51, WSW. strong, fair. 14th, 15th, centre of lowest pressure moved northeastward to near the Irish coast. 16th, isobar of 29.60 covered lower half of British Isles, the North Sea and extended southward to the continent; lowest pressures over England; at Oxford and Saint Ann's Head barometer 29.47; at Greenwich, Cardington, Kew Observatory and Oscatt, barometer 29.48; rain was reported quite frequently from southern stations. 17th, depression moved eastward over the North Sea; rain quite general over the British Isles extending thence to southern Norway. 18th, centre of depression in southern Scandinavia; at Christiania, barometer 29.46, E., light rain; Bergen, 29.54, calm; Vestervig, 29.34, NE., fair; Fanoë, 29.45, W. light rain. During the 19th and 20th the depression filled up quite rapidly over northern Scandinavia and Lapland by the descent of cold air from the Arctic regions consequent upon the formation of an area of decidedly low pressure to the southwestward over Iceland. This sudden change of atmospheric conditions did not altogether interrupt the eastward movement of the low area, as on the 21st, it again appeared to the southeast of the White Sea. At Archangel, barometer 29.52, SE. fair; St. Petersburg, 29.63,

NW., fair. 22d, moved eastward to near longitude 70° E.; Archangel, 29.41, W., light rain; Ekaterinburg, 29.39, WSW., thunderstorm. 23d, moved south southeast down the valley of the Obi where further evidence of its course could not be found on our charts. No. X, after the passage of low area No. II to the eastward on the 10th, the barometer began again to fall in south-eastern Russia, where, on the 11th, a new depression developed; at Kasan, barometer 29.30, W. 12th, storm centre moved eastward into Siberia; at Ekaterinburg, barometer 29.34, calm. 13th, depression gradually lost its identity as low area No. XII formed to the northwestward. No. XII, an outgrowth of the prevailing low pressure over Russia, appeared to take its initiatory form on the 13th, a little to the southeast of Finland. Moscow, 29.50, SSW., thunderstorm; St. Petersburg, 29.52, NW., light rain; Krotkovo, 29.62, S. thunderstorm; Kasan, 29.49, calm, light rain; Archangel, 29.48, NW., cloudy. 14th, depression moved to the southeast near longitude 50° E.; Kasan, 29.13, S., cloudy; Krotkovo, 29.31, W., cloudy; Ekaterinburg, 29.45, SSW., cloudy; 15th, moved east northeast beyond longitude 60° E. latitude 60° N.; Ekaterinburg, 29.17, SW., fair; Kasan, 29.18, W., cloudy; Krotkovo, 29.47, W., cloudy. 16th, again to the east and southeast; Ekaterinburg, 29.21, WSW., light rain; Kasan, 29.57, WNW., cloudy. 17th, moved to the south southeast up the valley of the Obi disappearing on the following day over southern Siberia; Ekaterinburg, 29.28, W., cloudy; Barnaul, 29.48, SE., cloudy. No. XIII.—On the 15th a decided fall in pressure occurred over central and northern Spain, probably superinduced by the passage to the northeastward, near latitude 50° N., of low area No. IX. 16th, lowest pressure passed eastward to the Mediterranean; lowest barometers at Barcelona and Murcia. 17th, lowest pressure over Northern Italy; lowest barometers at Pesaro and Moucalieri. On this and the following day the depression lost its identity with low area No. IX then prevailing to the northward over Germany and Scandinavia. No. XVI.—On the 20th an extensive area of low pressure prevailed over the ocean to the northwest of the British Isles in connection with the passage of area No. VIII. On the 21st this area divided near latitude 60° N., the southeastern portion confined within the isobar of 29.40 formed along the western coast of the British Isles, on which day northeast to southeast and southwest winds, with occasional rains, prevailed over the Islands; lowest barometer 29.35 at Armagh. 22d, depression moved northeastward over Scotland to near Norway, the circulation of the winds and the relative pressure of adjoining stations showed the centre to be over the North Sea near latitude 60° . At North Uist, barometer 29.47, E.; Aberdeen and Sandwick Manse, 29.51, NW.; Bergen, 29.51, W., light rain; Christiana, 29.62, SE., light rain; Vestervig, 29.57, S., light rain. 23d, centre of depression passed northeastward to the Gulf of Bothnia; Christiana, 29.37, SSW., thunderstorm; Haparanda and Brono, 29.38, N., fair; Hernosand, 29.34, NNE., light rain; Umea, 29.35, S., cloudy; Upsala, 29.41, NW., cloudy; Stockholm, 29.46, SW., cloudy. 24th, moved east and northeast to the White Sea; Haparanda, 29.41, NE., cloudy; Umea, 29.47, E., fair; Stockholm, 29.45, W., cloudy; St. Petersburg, 29.51, W., fair; Archangel, 29.49, S., fair. 25th, depression filled up by the descent of inflowing air consequent upon the appearance of low area No. XVI over Norway. No. XVI.—This area developed over the ocean to the southeast of Greenland on the 22d, owing its existence to the presence of low pressures to the northward of latitude 50° N., which had continued since the 17th. During this interval of five days no less than three distinct depressions had passed over or nearly over, this region. 23d, centre of lowest pressure passed east southeast to near the British Isles, along the coast of which, the barometer began to fall rapidly, with winds changing to south and southeast; lowest barometer at Galway, 29.44; in $51^{\circ} 20' N. 14^{\circ} 35' W.$, 29.42, SSW.; in $48^{\circ} 45' N. 18^{\circ} W.$, 29.74, W.; in $49^{\circ} 15' N. 50^{\circ} 20' W.$, 29.82, NW.; 24th, centre of lowest pressure over Scotland; Ardrossan, 29.45, SW., light rain; Glasgow, 29.47, W., light rain; Nairn, 29.48, calm, cloudy. 25th, centre of depression over Norway; Bergen, 29.43, SSW., light rain; Christiana, 29.40, SSW., light rain; Brono, 29.47, E., cloudy. 26th, transferred southeast beyond the Gulf of Finland; Kieff, 29.47, S., cloudy; Wilna, 29.49, NW., light rain; Dorpat, 29.50, N., thunderstorm; St. Petersburg, 29.52, E., cloudy. 27th, moved northeastward beyond latitude 60° N.; St. Petersburg, 29.13, NNW., light rain; Archangel, 29.31, ENE., heavy rain; Moscow, 29.27, S., light rain. 28th, passed eastward of the White Sea; Archangel, 29.19, E. 29th, disappeared over northern Russia. No. III.—This area throughout its course was confined almost entirely to the Atlantic Ocean, and therefore hardly belongs to the European storms. Central on the 3d, in about $40^{\circ} N. 26^{\circ} W.$, it moved slowly northeastward reaching the southern coast of Ireland on the 7th. On the 5th, in $48^{\circ} 45' N. 17^{\circ} 15' W.$, 29.50, NE., heavy rain; area of lowest pressure extended southeastward to northern Spain; Santiago, 29.64, SW., strong gale, light rain. 6th, in $48^{\circ} 30' N. 17^{\circ} W.$, 29.46, E., heavy rain; in $51^{\circ} 20' N. 16^{\circ} 30' W.$, 29.58, NE., strong gale, cloudy; in $52^{\circ} 15' N. 16^{\circ} 20' W.$, 29.79, NE., strong gale; in $45^{\circ} N. 23^{\circ} 15' W.$, NW., brisk; in $46^{\circ} N. 29^{\circ} 15' W.$, NW., brisk; in $48^{\circ} N. 15^{\circ} W.$, SW., fresh; Santiago, 29.80, SSW., light rain. 7th, in $49^{\circ} N. 15^{\circ} W.$, 29.50, NW., strong gale, light rain; in $52^{\circ} N. 23^{\circ} 45' W.$, 29.95, N., strong gale; Santiago, 29.65, SSW., light rain; Valencia, 29.44, SSE., misty; Roche's Point, 29.50 SE., light rain; Galway, 29.45, ESE., cloudy. 8th, area of lowest pressure covered the British Isles, accompanied by generally rainy or threatening weather; Falmouth, 29.44, SSE.; Valencia, 29.44, NW.; Armagh, 29.47; Roche's Point, 29.46, ESE. 9th, depression moved slightly to the north with a tendency to leave the western coast of Scotland; the pressure rose generally at all land stations, with winds shifting to east and northeast, but rain or threatening

weather still prevailed. 10th, disappeared to the northwest in an area of high pressure then prevailing over Iceland and to the southward. The following descriptions relate to the storms of Eastern Asia and the Pacific Ocean: No. VI.—On the 3d and 4th the barometer fell to the southwest of the Japan Isles, forming a slight depression which, on the 5th, passed over them to the northeast, with winds changing from northeast to southeast and southwest. Occasional light rains accompanied the depression on the first two days. On the 6th the centre passed eastward over the ocean. No. XI.—For some three days previous to the formation of a well defined area of depression the pressure over northern China had shown considerable variability. On the 11th, centre of depression lay to the northwest of Pekin, barometer at that station 29.39, SW., fair; the pressure to the southeast, at Shanghai and at other stations along the coasts of the Yellow and Japan seas, was below 29.60, with occasional rains. 12th, central over the Japan Sea; winds over the Japan Isles from southeast to southwest and to the northward, along the coast of Corea, from northeast to northwest; in 38° N. 150° E., barometer, 29.45, E., strong gale, heavy rain. 13th, passed eastward to about longitude 150° E. and thence northeastward over the North Pacific Ocean to the Aleutian Islands, whence the course again changed to east. On the 16th, reached the Alaska Peninsula, disappearing thereafter in an area of high pressure prevailing along the Pacific coast of North America. No. XIV.—On the 16th and 17th the pressure fell over southern China and particularly along the coast, where southeast to southwest winds and light rains prevailed. 18th, lowest pressure passed northeastward to the Yellow Sea; in $37^{\circ} 30'$ N. $122^{\circ} 12'$ E., barometer, 29.47, NNW., strong gale, light rain; Shanghai, 29.72, SW., fresh, cloudy; Nagasaki, 29.82, SW., brisk, cloudy; Pekin, 29.71, NW., fresh, light rain. 19th, depression passed east northeast over the northern portion of the Japan Islands, followed by rapidly rising pressure and winds shifting to west and southwest; rain still continued at Japanese stations and commenced along the northern coast of the Japan Sea. 20th, depression disappeared over the ocean. No. XX.—This area was probably a continuation of low area No. X from the European coast, but because of the entire absence of data over eastern Siberia it was not thought advisable to unite the two. On the 25th and 26th depression passed eastward to the south of the Kamtchatka Peninsula and thence northeastward over Kamtchatka Sea, reaching Alaska by the 28th. The barometer at Ft. St. Michaels fell steadily from the 26th, reaching its minimum on the 28th, 29.48, S, light rain. The winds at Unalaska shifted from northwest to southeast and southwest, accompanied on the 28th and 29th by light rains and rising temperature. 29th and 30th, depression disappeared to the eastward over British America, probably uniting with low area No. XXV, then central over the Saskatchewan Valley; a further description of this storm will probably appear in the JUNE REVIEW. Compared with June, 1878, Chart No. VI presents several points of resemblance as well as of contrast. Within the United States the storm tracks are confined to higher latitudes, none reaching to any extent south of parallel 40° . Over the Atlantic Ocean the same peculiarity is observed, added to which is the fact that the storm paths to the east of Greenland have pursued very much the same course, passing north northeastward between that country and Iceland, or skirting the eastern border of the latter. No storm, so far as our data can be depended upon, actually reached the mainland of Europe from America, while in June, 1878, two passed over the ocean in a distinct manner, and to a considerable distance inland. In western British America there is presented a striking similarity in the movement of a single area for each month, coming, as it did in each instance, from the neighborhood of Alaska and passing thence southeastward into the United States, the paths of each being almost identical. The peculiarity of the disappearance of storm areas over, or in the vicinity of Hudson's Bay, presents a noticeable resemblance for the two years. Three disappeared in June, 1878, and four in June, 1879. Over northwestern Siberia and in northern Russia the presence of storm areas was a marked feature of the month in June, 1879, while hardly one appeared over this territory in June, 1878. This contrast may appear more intelligible when we recall under the description of Chart No. V (this REVIEW) the comparatively higher pressures over this region in the latter year.

TEMPERATURE OF THE AIR.

The mean temperature of the air for May, 1881, is shown by the isothermal lines (in red) on Chart No. II. The table of mean and comparative temperatures in the right-hand corner of the chart shows, in the first column, the average for the month throughout the various districts, as deduced principally from observations taken at Signal Service stations. In the two remaining columns are shown the means for the present month, and the departures of such means from the average for many years. With the exception of the Rio Grande valley, the Southeast Rocky Mountain Slope and the Florida Peninsula, the temperature is everywhere above the normal, ranging from $+0^{\circ}.6$ in New England to $+6^{\circ}.2$ in the Upper Mississippi valley. The greatest departures are confined to the northern portions of the country east of the 100th meridian. A normal condition is reported from the Florida Peninsula, and only a change of $-0^{\circ}.5$ from the Southeast Rocky Mountain Slope.

Deviations from Mean Temperatures.—Under this heading departures exhibited by the reports from the regular Signal Service stations are shown in the table of comparative temperatures on